

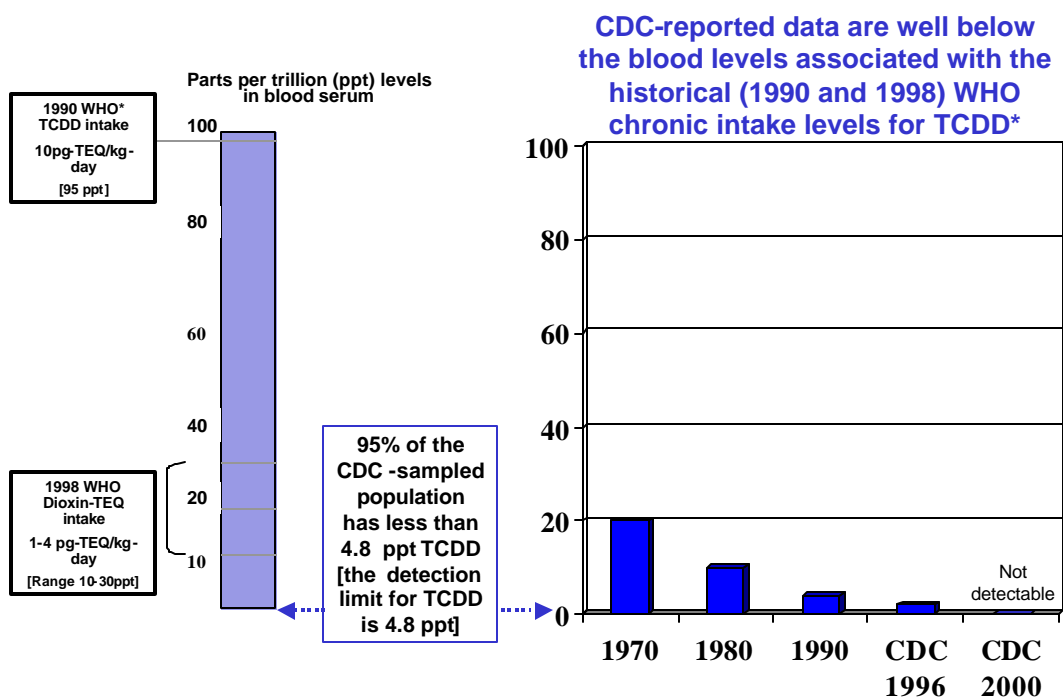
Interpreting the 2,3,7,8-TCDD (Dioxin) CDC Biomonitoring Data

Current Human Levels are Many Times Lower Than WHO Guidelines

The release of biomonitoring data, including human blood levels of many of the dioxin family compounds, by the U.S. Centers for Disease Control and Prevention (CDC), presents an opportunity to compare present dioxin human blood level data with World Health Organization (WHO) dioxin exposure guidelines. Although the term “dioxin” is used frequently to denote an entire family of 17 compounds, one member of this chemical family, 2,3,7,8-TCDD, stands out as the well-known subject of thousands of scientific studies. 2,3,7,8-TCDD is the most thoroughly investigated of all the dioxin family compounds due to its high toxicity relative to the other 16 compounds. In fact, the toxicities of the other 16 compounds are estimated based on comparisons with 2,3,7,8-TCDD.

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Understanding the CDC TCDD Biomonitoring Data



At a scientific meeting held in The Netherlands in 1990, the World Health Organization (WHO) established a tolerable daily intakeⁱ (TDI) for 2,3,7,8-TCDD of 10 pg/kg-body weightⁱⁱ. This exposure guideline was the last one set by the WHO solely for 2,3,7,8-TCDD; it did not apply to the other dioxin family compounds. This TDI corresponds to a 2,3,7,8-TCDD blood level of about 95 parts per trillion (ppt)ⁱⁱⁱ. As indicated by the graphic, the CDC biomonitoring data show human blood levels of 2,3,7,8-TCDD are non-detectable in 95% of the CDC sampled population at a detection level of 4.8 ppt.

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A re-evaluation of the 1990 TDI, based on new toxicological, epidemiological and mechanistic data on 2,3,7,8-TCDD, especially with respect to neurodevelopmental, reproductive, and endocrine effects, was made at a WHO Consultation in 1998 in Switzerland. The new TDI was expressed as a range between 1 and 4 pg/kg-body weight and it is applied not only to 2,3,7,8-TCDD, but to all the other dioxin-like compounds, using units of toxic equivalents (TEQ).^{iv}

In conclusion, current human body levels of 2,3,7,8-TCDD have dropped to non-detectable levels in most of the general population.

Reverse side Chart – Jan 31, 2003

Understanding the CDC TCDD Biomonitoring Data *Background Information*

Table 1: Summary of Results of CDC TCDD Biomonitoring

<u>TEQ Lipid Levels (ppt):</u>	<u>Mean</u>	<u>95th Percentile</u>
Adults	not detected	not detected
Children	not detected	not detected

Table 2: World Health Organization Acceptable Exposure Guidelines for TCDD

<u>Tolerable Intake Level</u>	<u>Equivalent Serum Lipid Level</u>
WHO (1990): 10 pg/kg/day	95 ppt
WHO (1998): 1-4 pg/kg/day	10-30 ppt

WHO (1990) level: The serum lipid level corresponding to a chronic intake of 10 pg/kg/day is about 95 ppt, assuming a 25 percent body fat level and an absorption rate of 60 percent.

WHO (1998) level: Range of maternal body burdens associated with LOAELs in animal studies: 28-73 ng/kg. Identified safety factor: 10.

Tolerable body burden range: 28/10 to 73/10 = 2.8 to 7.3 ng/kg

Corresponding serum lipid level: Assume 25% body fat: 11-29 ppt range of tolerable serum levels

Table 3: Estimated Average TCDD Levels

<u>Year</u>	<u>Parts per trillion (ppt)</u>
1970	20
1980	10
1990	4
1996	2.1 (CDC, 1996)
2000	Not detected (detection limit 4.8 ppt) (CDC 2000 data)

Source: Aylward, L., Hayes, S., (2002). Temporal trends in human TCDD body burden: Decreases over three decades and implications for exposure levels. *J. Expo Anal Environ Epidemiol* 12, 319-328.

CDC 1996 data are reported in the United States Environmental Protection Agency (USEPA). (2000) *Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin and Related Compounds. Draft Final*. Washington, D.C.: National Center for Environmental Assessment, U.S. Environmental Protection Agency. EPA/600/P-00/001Be. Part I. Vol 3, Chapter 4, p 4-97

Government public health agency safe exposure levels include built-in safety margins to account for variations in the human population as well as the uncertainties associated with drawing health conclusions for humans from data obtained in animal studies.

ⁱ Government public health agency safe exposure levels include built-in safety margins to account for variations in the human population as well as the uncertainties associated with drawing health conclusions for humans from data obtained in studies with laboratory animals. These safe exposure levels were derived from exhaustive reviews of health effects studies that considered relevant non-cancer end points including reproductive (e.g., sperm count declines, endometriosis), developmental (e.g., learning, cognitive) and neurological (e.g., behavioral) effects.

ⁱⁱ A “pg” is a picogram, equal to one-trillionth of a gram, or 0.000000000001g. 10 pg/kg-body weight indicates a daily human intake of 0.00000000010g per kilogram of body weight.

ⁱⁱⁱ Based on toxicokinetic calculations.

^{iv} WHO Consultation (1998). Assessment of the health risk of dioxins: re-evaluation of the Tolerable Daily Intake (TDI), Executive Summary. Geneva, Switzerland.